Mainstreaming Building Energy Efficiency Codes in Developing Countries

International Workshop
ESMAP – CFU (WB)

Breaking BEEC’s Grounds - Mexico’s Low Income Housing Programs

Washington, 2009
Overview of the housing sector
After the 1990’s severe crisis, the housing sector has been growing at an annual rate of 17.3%
The ten largest homebuilders in México build 25 – 45% of the housing market. Low-income housing developments produced by these developers have 100 – 2500 houses on average. Larger housing developments might contain more than 15,000 units. Because of the limited urban land availability, homebuilders have urban reserves equivalent to 2 - 5 years and are continuously acquiring more.
HOUSING DEVELOPMENTS
HOUSING DEVELOPMENTS
The Residential Building Code (CEV):
A Strategic Instrument for Sustainable Housing Development Programs
Local governments in Mexico, are responsible for setting standards and rules for urban planning, urban design and building construction.

Some building codes are not updated and do not include new subjects, although eventually, some regulations have been modified and updated.

There is no national law that defines the basic premises for regulation on safety and the protection of buildings and structures.
## Mexican Green Standards
Based on the Federal Law for Metrology and Standards

### NOM — Official Mexican Standard
- Mandatory
- Established by Federal Agencies
- Contain regulations, specifications, attributes, and provisions.
- Have a real objective, such as public welfare, protect the environment, etc.

### NMX — Mexican Standard
- Voluntary
- Contain technical specifications
- Established by consensus
- Based on experience and technical development

<table>
<thead>
<tr>
<th>Products</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact fluorescent lamps</td>
<td>Thermal envelope for residential buildings</td>
</tr>
<tr>
<td>Water closets</td>
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<tr>
<td>Showerheads</td>
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<tr>
<td>Water quality</td>
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<td>Water heaters</td>
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<table>
<thead>
<tr>
<th>In force</th>
<th>In process</th>
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</thead>
<tbody>
<tr>
<td>Thermal insulation – $R$-Values</td>
<td>Thermal insulation test methods</td>
</tr>
<tr>
<td>Valves for domestic water use</td>
<td>Foam block</td>
</tr>
<tr>
<td>Residential supervision and inspection services</td>
<td></td>
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<tr>
<td>Construction materials such as: cement, blocks, steel bars, aggregates, etc.</td>
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### DIT—Technical Suitability Report

In the absence of a NOM or NMX Standard, this is a criteria developed under a specific protocol for quality assurance purposes.

### Mexican Green Standards
Based on the Federal Law for Metrology and Standards

#### Products

<table>
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<th>In force</th>
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<tbody>
<tr>
<td>Solar – gas water heater</td>
<td>Photovoltaic panel systems</td>
</tr>
<tr>
<td>LED (light emitting diode)</td>
<td>Motion sensors for lighting</td>
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</table>

CEV IS A NATIONAL MODEL CODE, to be adopted and adapted by the local authorities.

1. Development of sustainable indicators as a baseline to define recommendations for policies, standards and regulations.

2. Establish the minimum criteria for "green mortgages”

3. Development of standards and regulatory instruments such as building codes and energy efficiency codes

4. Development of an evaluation system to differentiate levels of sustainability

5. Development of standards and rating systems

Sustainability Criteria in the Residential Building Code

- Site selection
- Green building design
- Energy efficiency
- Water use efficiency
- Renewable energy
- Solid waste management
IMPLEMENTATION

AT THE FEDERAL LEVEL:
Develop a Model Code

Define the Model Code structure
Develop the models for:
- Voluntary Application
- Bases and standards
Create groups to reach consensus

At state and municipal level:
Adoption y Adaptation

- Provide information and training to local organizations
- Implement pilot programs in municipalities with highest housing production
- Identify necessary changes in standards

UPDATING AND EVALUATION

- Generate a professional and specialized inspection and supervision system
- Establish committees made of certified professionals to update existing codes
Milestones

- 2007 – CONAVI publishes the Residential Building Code (CEV) The CEV and sustainable housing developments become a priority in Mexico’s Housing Policy.

- 2008 – CONAVI promotes the CEV for adoption among local governments. Sustainable Construction practices are encouraged.

- 2008 – 2009 The CEV’s Sustainability Chapter is aimed to provide criteria for a rating system for green residential buildings.

- 2010 – Criteria in the Residential Building Code shall be considered part of the requirements of a Clean Development Mechanism CDM.
MEXICO’S RESIDENTIAL BUILDING CODE

2009

• Model code to be adopted by local authorities to **set minimum building standards**

• Objective is to regulate home building process in an urban context to improve public health, safety and welfare

• The requirements of these standards are not mandatory until adopted

• The term “Shall” is used to indicate that the provision is mandatory (when adopted)

• Includes a chapter in Sustainability to set criteria for green residential building

• **Energy efficiency chapter includes a performance Path and a Prescriptive Path**

2010

• To achieve compliance with specified **performance levels for green residential building**

2011

• Development of criteria for **rating** the environmental impact of design and construction practices
CONAVI establishes housing policies and practices to achieve sustainability in housing

**Regulation**
- Standards, codes, certification

**Research & development**
- Building materials, building systems, evaluation, etc.

**Training and information**
- Building materials, building systems, evaluation, etc.

**Financing instruments for builders, manufacturers and buyers**
- Subsidies, Green mortgage, Carbon certificates, Fiscal and administrative incentives

**RESIDENTIAL CODE**
- SUSTAINABILITY CRITERIA
- CLEAN DEVELOPMENT MECHANISM
- GREEN MORTGAGE
- SUBSIDIES PROGRAM
- SUSTAINABLE HOUSING CERTIFICATION
Technical Criteria for Sustainable Housing Developments.

Clean Development Mechanism (CDM) of the Kyoto Protocol
Technical Criteria for Sustainable Housing Developments

Urban development

CDM, Technologies

Green Homes

Different combinations of technologies:

- Efficient lighting
- Thermal envelope
- Solar water heating
- Photovoltaic systems
- Efficient air conditioning
- Systems for water saving

A. Location, densities, vertical edification and services
   I. Integration and proximity to the urban zone
   II. Infrastructure
   III. Land use and housing density

B. Efficient use of energy and water
   I. Gas, electric power and thermal envelope
   II. Passive systems: Urban and architectural design
   III. Water availability, water supply in housing
   IV. Wastewater and graywater

C. Solid waste management
   I. In housing
   II. Green areas
Conavi commissioned EcoSecurities to develop a CDM methodology to carry out the sustainable housing program through the CDM.

The new methodology was approved in July of 2009 under the name “AMS-III.AE Energy efficiency and renewable energy measures in new residential buildings.”

First CDM methodology to allow for holistic efficiency measures in new residences.

It establishes a systematized method to measure and monitor emission reductions from the new residential developments being subsidized by CONAVI.
WHY THE CDM IS IMPORTANT FOR CONAVI?

• The methodology and the implementation of the subsidies were developed with a **Programmatic CDM** in mind from the beginning

• **PoA** rules now allow for the inclusion of more than one methodology. This program will use:
  – **AMS-I.C** (for solar water heaters)
  – **AMS-III.AE** (for electricity efficiency)

• Will allow a government program to generate carbon credits

• Will set the precedent for any potential commitments in a post-Kyoto regime.
- Passive solar designs
  - Windows overhangs
  - Cross ventilation
  - Heat bombs
  - Insulation

- Efficient technologies
  - Lighting
  - Air conditioning

Reductions in energy use

- Photovoltaic systems

Renewable energy

- Solar water heaters
- Automatic water heaters

Reductions in gas consumption to heat water

Characteristics and technologies must be present in all the houses in the development
WHAT DOES THE PROGRAM MEASURE?

It establishes a method to measure and monitor emission reductions due to energy efficiency features in new residences.

Baseline emissions

Emission reductions = Carbon credits

Program emissions

Baseline consumption is calculated based on a computer model and project residence consumption is sampled.

Baseline and project consumption is sampled; savings are determined through a regression analysis.

- Incandescent light bulbs
- Residences with no thermal insulation
- Inefficient appliances
- Inefficient architectural design
- Energy supplied by the grid 100%
- Boiler type water heaters

- Compact fluorescent light bulbs
- Residences with thermal insulation
- Efficient appliances
- Bioclimatic design
- Partial supply of energy from photovoltaic panels
- Solar and instant water heaters**
## ESTIMATED ANNUAL EMISSIONS

### Baseline Scenario

<table>
<thead>
<tr>
<th></th>
<th>Temperate</th>
<th>Very hot during summer</th>
<th>Hot all year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emissions Ton of CO₂</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>0.74</td>
<td>2.26</td>
<td>3.79</td>
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<tr>
<td>Gas</td>
<td>0.98</td>
<td>0.98</td>
<td>0.20</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1.71</strong></td>
<td><strong>3.24</strong></td>
<td><strong>3.99</strong></td>
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### Sustainable Housing Scenario

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<tr>
<td><strong>Emissions Ton of CO₂</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>0.62</td>
<td>1.06</td>
<td>1.51</td>
</tr>
<tr>
<td>Gas</td>
<td>0.49</td>
<td>0.49</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1.10</strong></td>
<td><strong>1.55</strong></td>
<td><strong>1.71</strong></td>
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Federal Subsidies

The federal government through the program *Esta es tu casa*, (This is your Home) contributes to the building of sustainable housing by giving subsidies to low income housing buyers that are not able to cover financing granted.

Houses shall include basic technical criteria:
- Gas,
- Electricity
- Water

Home buyers are able to get savings on:
- Energy consumption
- Utility payments (gas, electricity and water)
- CO₂ emissions

Green Mortgage

Green mortgage is based on additional capacity generated from savings in consumption of electricity, gas and water. Thus, permitting to increase the amount of credit that an employee is entitled to because of a higher home value derived of the energy efficiency technologies.
Thank You!

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National Housing Commission www.conavi.gob.mx